VCA ENGINEERS, INC.
CIVIL ■ STRUCTURAL
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QUALITY SERVICE COMMITMENT

SITE INFRASTRUCTURE ASSESSMENT

FOR

LAKE ARROWHEAD LODGE GLAMPING PROGRAM

November 30, 2021

Prepared For:
UCLA PROJECT MANAGEMENT
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1. Purpose and Introduction

The purpose of this report is to evaluate the infrastructure impacts as it relates to the Lake Arrowhead Lodge Glamping Program project within the unincorporated community of Lake Arrowhead, California. Refer to **Appendix A** for the general vicinity of the project. The report will analyze impacts to hydrology and drainage, water, sewer, and water quality management.

2. Project Summary

Project Description:
The proposed project would construct a total of ten additional cabins and two additional restrooms. Two cabins will be accessible through an additional road that will tee off from the main road that wraps around the hill north of the main lodge. The cabins will sit on structural decks that will utilize pile foundations to sit above grade. Refer to **Appendix B** for site layout. The cabins will accommodate a maximum of two people that will increase the capacity of guests by 20 people. Out of the ten cabins, two will be compliant with ADA along with both restrooms.

The proposed project will sit on the outer rim of the hill north of the UCLA Lake Arrowhead Lodge property. The cabins will sit scattered throughout the area, accessible through the hiking path within the property and by road leading to the softball field. The restrooms will be accessible by road in the northern portion just south of the existing baseball field, and by a trail on the eastern portion.

Project Justification:
UCLA Lake Arrowhead Lodge provides guest accommodations and conference space. The Lodge currently has a shortage of overnight guest accommodations compared to the current conference capacity of 225 guests. The proposed project would add ten cabins to help address the shortage.

The proposed Lodge Glamping Program would expand guest capacity for the UCLA Bruin Woods Family Resort, which always has a long waiting list.

Staging Impacts:
Minimal impact to the UCLA Lake Arrowhead Lodge operations is anticipated. Construction would occur in areas not currently used for programmed activities, and thus would not impact normal conference functions.

Schedule:
Construction is planned to start in July, 2022 and complete in June, 2023.

3. Hydrology And Drainage Conditions

Under existing conditions, the site currently sits along the rim of a hill located at the apex of two major drainage areas. These drainage areas are identified by their discharge points which are into Lake Arrowhead to the south of the property and into Willow Creek to the east as shown on

Appendix C. While there exists some subterranean storm drain system located along the main lodging area, the proposed site location conveys storm water runoff through sheet flow into conveyance channels or culverts. The existing site sits in the outer rim of hill which is north of the main lodging area. As previously mentioned, the cabins and restrooms will be isolated from one another but they will remain in a general vicinity and can be accessed by road that wraps around the hill. The proposed area for the project is currently undeveloped which follows the existing drainage pattern flowing from the top of the hill to the base towards West Shore Road and Willow Creek Road.

The flow generated from the eastern portion of the existing site drains towards the public right of way (Willow Creek Road) which then flows north into existing catch basins located along the road. The two existing catch basins route the runoff via a 24-inch CMP culvert located by the existing tennis courts and a 36-inch CMP culvert located northeast of the site under Willow Creek Road ultimately discharging into Willow Creek to the east. As shown in **Appendix D**, Willow Creek routes north joining with Deep Creek eventually discharging into the Mojave River Basin north of the San Bernardino Mountain range.

The Western portion of the site flows towards West Shore Road into an asphalt gutter located along the road which connect to several CMP that routes the surface runoff through the existing site and vegetative swales and ultimately south towards a culvert located at the intersection of North Shore Rd and Willow Creek Road. The existing culvert drains the surface runoff towards the southern portion of Willow Creek which is divided by a dam structure that separates runoff between flowing south and north. The culvert routes the flow south into Lake Arrowhead.

The proposed project will maintain the same drainage pattern and subareas to convey excess storm water runoff generated by the eastern portion of the site to Willow Creek Road and storm water runoff generated west of the site into the existing culverts. The proposed project effectively consists of 10 sub tributary areas isolated from one another. Since the cabins will sit on piles, the runoff from adjacent areas are not expected to be interrupted, however the cabins will introduce new impervious areas along with the expansion of the road that will affect the amount of peak flow that the site generates. Refer to **Table 1** for difference in imperviousness and peak flow rates for the western part of the project site which drains to Lake Arrowhead. Refer to **Table 2** for difference in imperviousness and peak flow rates for the Eastern portion of the site which drains to Willow Creek.

Table 1: Existing Versus Proposed Site Imperviousness for Lake Arrowhead Drainage Area(Western portion of the site)

Condition	Total Drainage Area	Impervious Area	Impervious Area Percentage	Peak Flow Rate[1]
Existing	2.98 (130,020 sf)	12,584 sf	9.68%	15.12 cfs
Proposed	2.98 (130,020 sf)	16,475 sf	12.67%	15.42 cfs

Table 2: Existing Versus Proposed Site Imperviousness for Willow Creek Drainage Area(Eastern portion of the site)

Condition	Total Drainage Area	Impervious Area	Impervious Area Percentage	Peak Flow Rate[1]
Existing	9.67 (421,025 sf)	175,615 sf	41.71%	65.24 cfs
Proposed	9.67 (421,025 sf)	178,053 sf	42.29%	65.68 cfs

1. *Peak Flow Rate calculations are per values and methodology as is presented in the San Bernadino Hydrology Manual.*

4. Water Services

Water Infrastructure:

The existing facility is served by the Lake Arrowhead Community Services District ("District"). The District provides water service to the Lake Arrowhead community and wastewater services to customers in the Lake Arrowhead and surrounding communities. Today, the District serves approximately 8,500 water connections and 10,500 wastewater connections. The District operates two water treatment plants, 19 water pumping stations, two wastewater treatment plants, 21 wastewater pumping stations, 20 reservoir tanks and several hundred miles of pipelines.

The project has an existing 3-inch water service lateral that services the existing restroom adjacent to the baseball field that branches off the existing 2-inch onsite private water lateral. The existing private water main ties into the existing public 8-inch water main in Willow Creek Road at a vault southeast of the project area.

The proposed project consisting of the cabins and two restrooms will connect via two new 3-inch branch service lateral off the existing onsite private 3-inch lateral to service the two restrooms. No water service shall be routed for the cabins. Water utility demands will be finalized during design.

Glamping Program Water Demands Summary:

While the project will not provide potable water to the proposed cabins, the two proposed restrooms will be utilized to service needs for guests for the ten cabins which total to 2,171 square feet for the ten proposed cabins.

The proposed water demands are estimated in **Table 4**. As no Lake Arrowhead water duty factors were available, the City of San Bernardino Water Master Plan water duty factors were utilized. Residential low water duty factors were employed for the cabins which would be for lodging.

Water Demand Calculations Summary:

Table 3: Estimated Water Demand

Land Use	Acreage	Water Demand Factor	Water Demand
Proposed			
2,171 SF Cabins	0.05[1]	2,594 gpd/acre	129 gpd
		Total Proposed Water Demands	129 gpd
		Total Proposed Water Demands with 20% SB-7-7 reduction + CA Green Building Code	**103 gpd**

[1] *The acreages utilized to estimate water demands only account for areas of the project that generate water demands and do not include walkways and other similar impervious features.*

Proposed water demands are estimated to be 129 gpd. Per the District's 2015 and 2020 UWMP, the District is required to reduce water demands by 20% by 2020. The water duty factors implemented in this analysis are from the City of San Bernardino Water Master Plan which was published in 2015 and utilized data from 2007. Therefore, proposed water demands should include a 20% reduction to meet this goal. In addition, California Green Building Code requires low flow fixtures that will reduce water demands as compared to the outdated fixtures currently at the project site. Therefore, it is anticipated that the project will increase water demand by approximately 103 gpd as it pertains to the entire property. Overall, despite increasing the water demand, the proposed project should not impact the existing 6-inch onsite private water main or the existing 8-inch public main in Willow Creek Road as the development adds only two restrooms and will not provide water service to the proposed cabins.

5. Sewer Services

Sewer Infrastructure:
The Lake Arrowhead Community Services District ("District") also provides wastewater services to Lake Arrowhead including the proposed project. The existing lateral servicing the existing restroom adjacent to the baseball field is served by a 4-inch sewer lateral that connects to an existing 4-inch sewer lateral eventually connecting to a public sewer manhole in Willow Creek Road.

The proposed Glamping project will add two additional 4-inch sewer laterals for the two restrooms and tie to the existing 4-inch sewer lateral as shown in **Appendix E.**

As noted in the previous section, the cabins will not have water or sewage service, the restrooms will be used to accommodate the guests that will reside in the proposed cabins. **Table 4,** shown below, estimates the sewer flows that will be generated by the new lodging from the cabins. As sewer flows and water demands are similar, the same methodology to estimate water demands was employed to estimate sewer flows. This approach is consistent with other agencies within Southern

California (e.g. City of Los Angeles).

Table 4: Estimated Sewer Flows

Land Use	Acreage	Sewer Demand Factor	Sewer Flows
Proposed			
2,171 SF Cabins	0.05[1]	2,594 gpd/acre	129 gpd
		Total Proposed Sewer Flows	129 gpd
		Total Proposed Sewer Flows with 20% SB-7-7 reduction + CA Green Building Code	**103 gpd**

[1] *The acreages utilized to estimate sewer flows only account for areas of the project that generate sewer flows and do not include walkways and other similar impervious features.*

As shown above, utilizing the City of San Bernardino Water Master Plan yields an increase in sewer flows of 129 gpd when considering the entire property. However, as noted above in the water section, this increase is not representative of recent water conservation efforts throughout the state of California which has shown to decrease water demands as well as local and regional sewer flows. A sewage study is recommended to analyze the existing capacity of the 4-inch sewer lateral. In addition, it is recommended that the sewer capacity of the existing main line be monitored to assess the viability of the project and demand.

6. Surface Water Quality Requirements And MS4 Compliance

San Bernardino MS4 Permit Overview:

The 2013 Phase 2 Small Municipal Separate Storm Sewer System Permit (MS4 Permit), adopted by the State Water Resources Control Board (SWRCB) and overseen by the Lahontan Regional Water Quality Control Board, requires all new development and significant redevelopment projects to incorporate Low Impact Development (LID) Best Management Practices to the maximum extent practicable (MEP). In addition, the Phase 2 MS4 Permit also requires development of a standard design and post-development best management practice (BMP) guidance for incorporation, where feasible and applicable, of site design/LID, source control, and treatment control BMP (where feasible and applicable) to reduce the discharge of pollutants to receiving waters. Per **Appendices C and D,** Willow Creek will receive stormwater runoff from the eastern portion of project site and eventually outfall into the Mojave River Basin at the north side of the San Bernardino Mountains. The western portion of the site will flow into Lake Arrowhead, which is also within the Lahontan Regional Water Quality Control Board jurisdiction.

Regarding LID practices specifically, the 2013 Phase 2 MS4 permit requires project proponents to first consider preventative and conservation techniques (e.g., preserve and protect natural features to the maximum extent practicable) prior to considering mitigative techniques (structural treatment, such as infiltration systems). The mitigative measures should be prioritized with the highest priority for BMPs that remove storm water pollutants and reduce runoff volume, such as hydrologic source

control and infiltration, then other BMPs, such as harvesting and use, evapotranspiration and biotreatment should be considered. To the maximum extent practicable, these LID BMPs must be implemented at the project site. The Regional Board recognizes that site conditions, including site soils, contaminant plumes, high groundwater levels, etc., could limit the applicability of infiltration and other LID BMPs at certain project sites. Where LID BMPs are not feasible at the project site, more traditional, but equally effective control measures should be implemented. Where preferred LID BMPs are infeasible, the Permit provides for alternatives. (SWRCB Order 2013-0001-DWQ NPDES No. CAS000004, Section F.5.g.3)

Post-Construction BMP Selection:

Per the Mojave River Watershed Technical Guidance Document for Water Quality Management Plans (WQMP) Section 1.4.3.1, LID BMPs will be required since the proposed development will disturb more than 5,000 square feet in a hillside area with a natural grade of 25% or greater. Per **Appendix D**, there are ten disturbed areas independent of each other which as noted before includes ten cabins, a roadway and two restrooms. Using the Mojave River Watershed TGD methodology for determining the 85th percentile storm event volume, the Design Capture Volume that will need to be treated is 1,617 cubic feet of storm water for the combined disturbed area. The methodology presented in the TGD considers the rainfall depth, area imperviousness, and drawdown rate.

Per the geotechnical report from Geotechnologies, Inc. dated July 9, 2021, the site is mantled with a thin cover of fill soil and natural colluvium over granite bedrock varying in depth from 1.5 to 4 feet. Consequently, storm water infiltration is not a suitable BMP strategy given the shallow depth of impervious bedrock. Likewise, given the small area of each area, harvest and use strategies will be infeasible. Therefore, the project may pursue a volume-based planter biofiltration BMP system or proprietary flow through biofiltration BMP. Additional details will be provided within the project-specific WQMP as required by the County.

Per the Phase 2 MS4 permit guidelines, if all on-site BMP solutions are infeasible, the project may consider alternative post-construction measures in-lieu of some or all the requirements to support multiple benefits projects. Concerning BMP maintenance, all BMPs shall be maintained per the Mojave River Watershed Technical Guidance Document for Water Quality Management Plans (TGD).

Construction Related Stormwater Pollution NPDES Nationwide Permit Applicability:

Clearing, grading, excavation and construction activities associated with the proposed project may impact water quality due to sheet erosion of exposed soils and subsequent deposition of particulates in local drainages. Particularly, grading activities lead to exposed areas of loose soil, as well as sediment stockpiles, that are susceptible to uncontrolled sheet flow. Although erosion occurs naturally in the environment, primarily from weathering by water and wind action, improperly managed construction activities can lead to substantially accelerated rates of erosion that are considered detrimental to the environment.

Prior to the issuance of grading permits, the project applicants shall provide evidence that the development of the projects one acre or greater of soil disturbance shall comply with the most current Construction General Permit (CGP) (Order No. 2009-0009-DWQ, as amended by 2010-0014-DWQ and 2012-0006-DWQ) and associated local National Pollutant Discharge Elimination System (NPDES) regulations to ensure that the potential for soil erosion is minimized on a project-by-project basis. However, as the proposed project is disturbing less than one acre (currently 0.17 acres is limit of disturbance), CGP does not apply, and a Stormwater Pollution Prevention Plan (SWPPP) will not be required for this particular project but will be prepared.

The proposed project will include an erosion and sediment control plan (ESCP) as part of the grading plan set which will serve to protect water quality downstream of the project site during construction. Some sediment control BMPs such as silt fences and gravel bags will likely be implemented to prevent project site sediment runoff into the local Willow Creek and Lake Arrowhead watershed. Additionally, proper waste management and vehicle tracking mitigation measures will also likely be implemented to prevent pollutants from entering Willow Creek and Lake Arrowhead.

7. Impact Assessment

From a site drainage assessment standpoint, the post condition imperviousness is significant more than the existing area for the project is currently undeveloped. That is to say, the existing condition at the project location contained no impervious area. However, when taking into account the two major drainage areas, the difference is less significant. The change in flow being generated for the drainage areas are not drastic enough to affect existing storm drain conveyance with the change in impervious area being single digit (3% increase to the west and less than 1% to the east). It is also important to note that the cabins will sit above ground level so flow from upstream the hill will not be impeded by the cabin structures. In addition, the Geotechnical Report for the site indicates a shallow bedrock which also affects the runoff being generated. In this case the shallow bedrock would limit the infiltration of the soil which would generated more flow as storm water sheet flows downstream. The roadway extension and restrooms will sit at grade but from what was previously discussed will not have a significant impact. Overall, the storm water runoff for the proposed project is not expected to have a major impact on existing storm drain structures or conveyance.

Since the project will disturb more than 5,000 square feet of area in a hillside area with natural grade greater than 25%, the project will trigger the development of a WQMP per local Phase 2 MS4 Permit requirements to limit the impact of new impervious area on storm water runoff. For the proposed project and the constraints of the site including shallow bedrock and limited demands for re-purposed storm water, Infiltration and Capture and Reuse BMP strategies for meeting storm water mitigation requirements are deemed infeasible. Biofiltration will likely be the ultimate BMP strategy for the project to meet Phase 2 MS4 Permit requirements. An alternative post-construction measure approach can be pursued, which would include, but not limited to, measures that benefit water supply, flood control, habitat enhancement, etc. (Refer to SWRCB Order 2013-0001-DWQ NPDES No. CAS000004, Section F.5.g.3 for an exhaustive list) The project's final design will

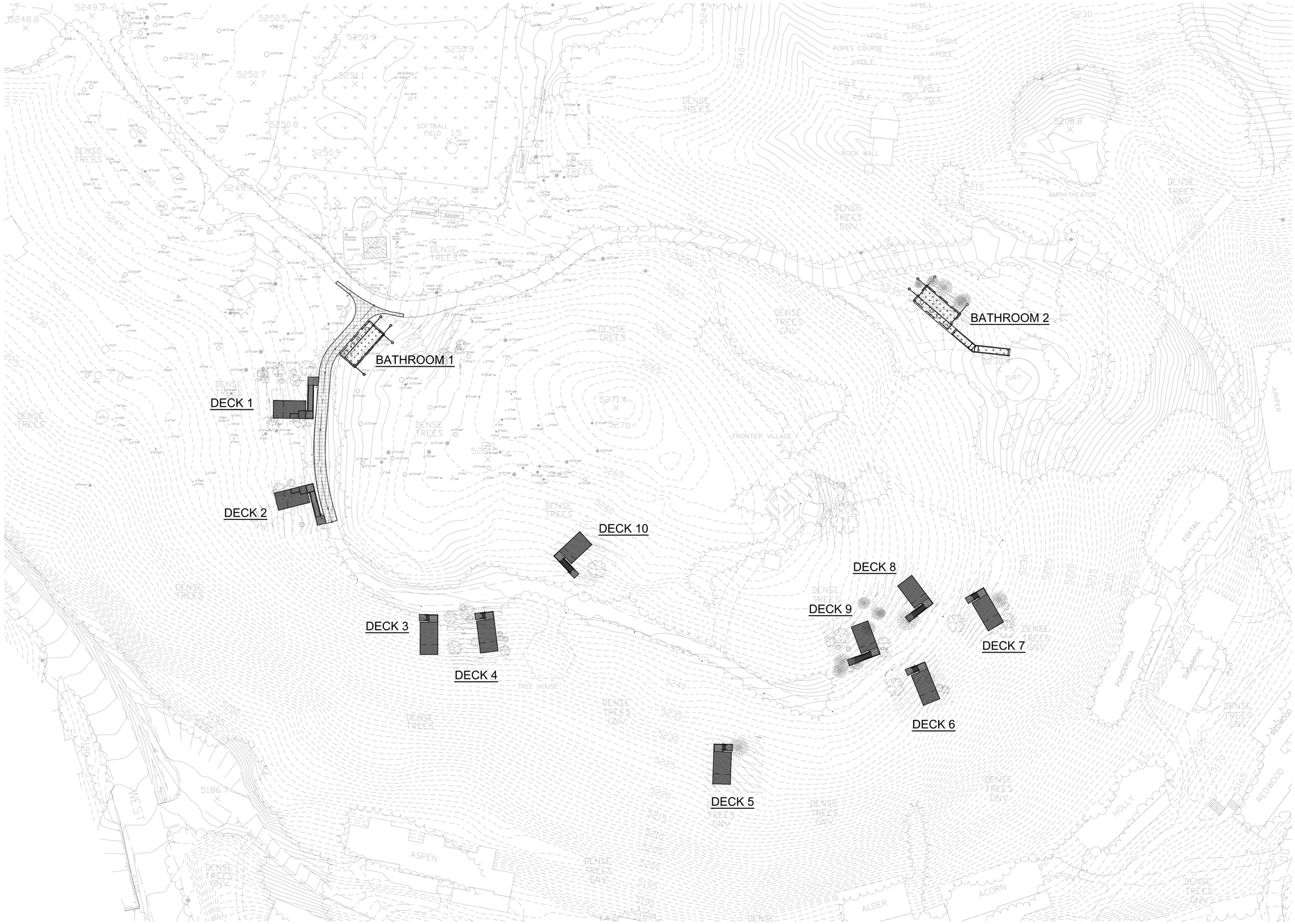
dictate BMP sizing and site placement strategies as part of a project-specific WQMP. Ultimately, the new impervious area introduced by the proposed development will generate a volume of 1,617 cubic feet to be treated as determined per local guidance to meet Phase 2 MS4 Permit requirements. This will minimize the impact of the new development on existing conditions.

Regarding water and sewer infrastructure, water demand and sewer flows are greater than existing conditions. Utilities for both will be installed for the new restrooms for a total of two new potable water laterals and two new sewer laterals. Water would only be servicing the restrooms and the cabins would not require potable water service. The water service for the two restrooms will increase demand for the existing onsite water utility. More information such as existing water pressure along the water utility lines would be needed to fully investigate the impact from the increased water demand for the restrooms. Though it is anticipated it would not be significant based on the proposed improvements. From available as-builts, the existing sewer lines have enough slope to be able to convey the additional demand from the two restrooms proposed in this project.

8. Appendices

A. Vicinity Map
B. Schematic Site Plan
C. Drainage Area Map
D. Watershed Map
E. Schematic Utility Map

APPENDIX A: VICINITY MAP
NTS



LEGEND:

- PROPOSED ROAD
- PROPOSED COTTAGE
- PROPOSED RESTROOM

APPENDIX B: SCHEMATIC SITE PLAN

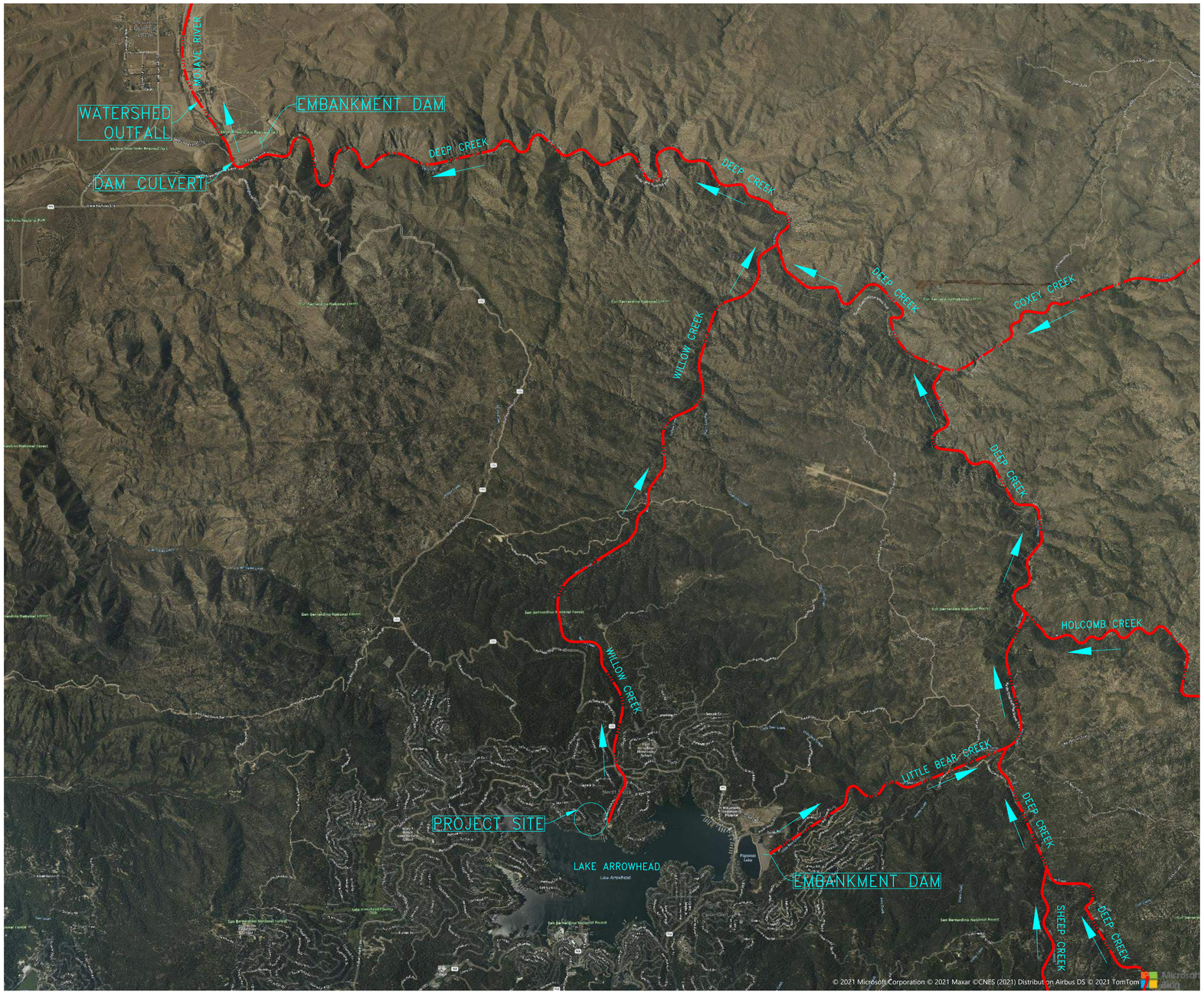
30 15 0 30 60

SCALE: 1" = 30'

APPENDIX C: DRAINAGE AREA MAP

100 50 0 100 200

SCALE: 1" = 100'



LEGEND:

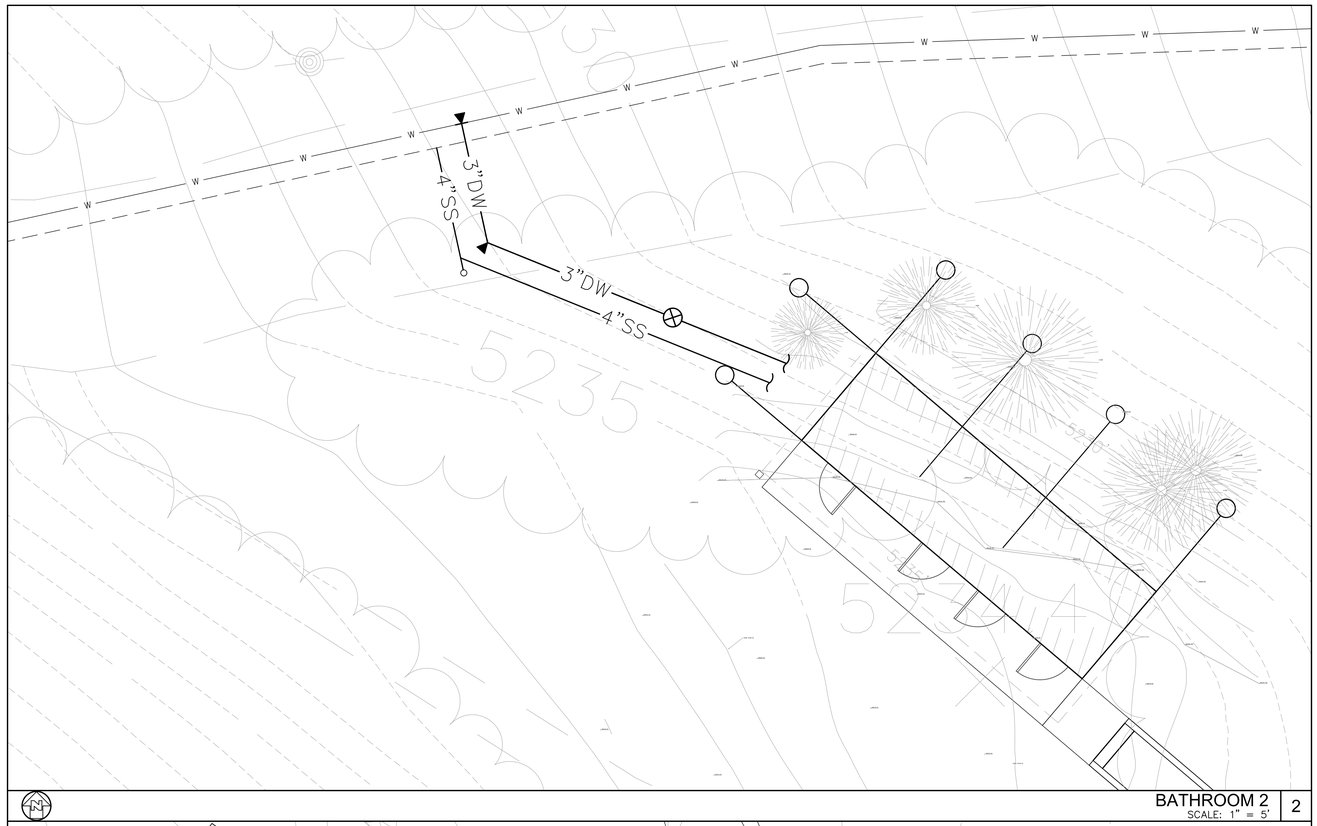
CREEK FLOW LINE

FLOW DIRECTION

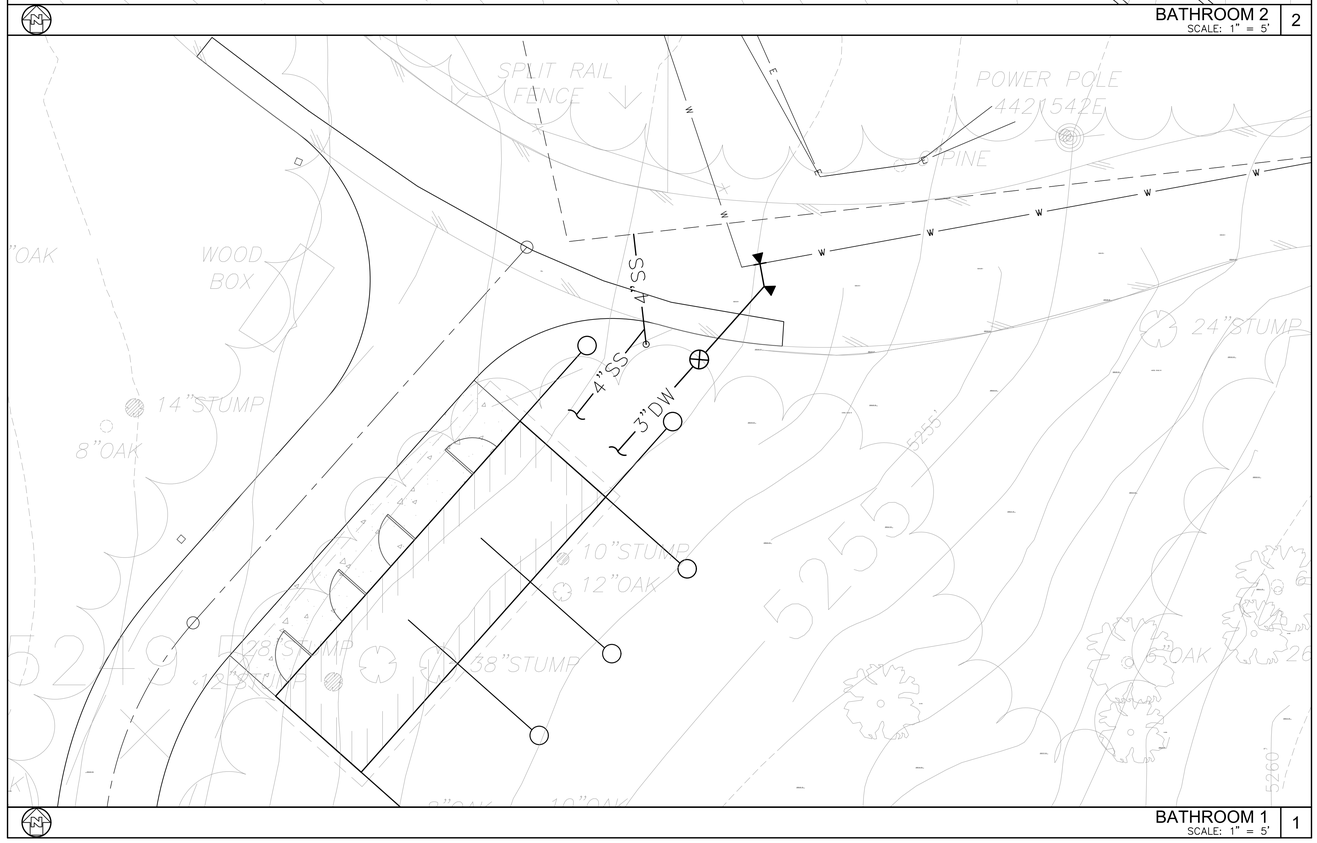
APPENDIX D: WATER SHED MAP

2000 1000 0 2000 4000

SCALE: 1" = 2000'



BATHROOM 2
SCALE: 1" = 5'
2



BATHROOM 1
SCALE: 1" = 5'
1

LEGEND:

- SS PROPOSED SEWER LINE
- DW PROPOSED WATER LINE
- W EXISTING WATER LINE
- EXISTING SEWER LINE

APPENDIX E: SCHEMATIC WATER AND SEWER PLAN

10 5 0 5 10

SCALE: 1" = 5'